

INTERNATIONAL FOOD INFORMATION SERVICE

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FAB 3

NATURAL AND SYNTHETIC SWEETENERS

SELECTED FROM VOLUME 8  
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Under the direction of

Commonwealth Agricultural Bureaux, Farnham Royal, Bucks; Institut für Dokumentationswesen,  
Frankfurt am Main; Institute of Food Technologists, Chicago; Centrum voor Landbouwpublikaties  
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## INTRODUCTION

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Some of the larger FABs have been divided into sections to facilitate use. Abstracts are not printed in more than one section. The larger FABs also have subject indexes provided.

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Coverage of the subject has been restricted to that of Food Science and Technology Abstracts, which covers over 1200 of the important food journals, patents from 20 countries and books published world-wide. Every effort is made to include all significant references, but editorial discretion is used on the many articles of borderline interest. If the reader particularly needs an exhaustive search of the subject, we will be pleased to provide any other references that we have available. We would, in any case, encourage readers to write or telephone us with any comments or queries that they may have.

H. BROOKES

ASSISTANT EDITOR







## 1

**[Reduction of sugar usage in non-alcoholic drinks production.]**

Paszko, T.

*Przemysł Fermentacyjny i Rolny* 19 (5) 33-34

(1975) [Pl] [Zrzeszenie Produkcji i Obrotu  
Napojami Bezalkoholowymi, Warsaw, Poland]

Production data for 1974 are given for non-alcoholic drinks. A starch plant in Ilawa due to start production in 1975 will substitute sucrose by glucose, starch syrup and fruit juice concentrates.

In the last quarter of 1974, technological experiments and organoleptic evaluations were carried out with the 3 ingredients and 7 variants which differed in the amount of extract and the amount of kind of sugar, the sucrose content being reduced. About 15 000 t of sugar was saved during 1975. An increase of non-alcoholic drinks production is planned for 1976-1980. STI

## 2

**Structural functions of taste in the sugar series:****Gustatory properties of anhydro sugars.**

Lee, C. K.; Birch, G. G.

*Journal of Food Science* 40 (4) 784-787 (1975)

[35 ref. En] [Nat. Coll. of Food Tech., Weybridge, Surrey, UK]

Studies of the stereochemical basis of sweetness in sugar molecules are limited by the availability of suitable model substances and by their intrinsic stability, ring size and shape. Previous reports elucidated molecular patterns which elicit sweetness and are related to hydrophilic or hydrophobic bonding ability. Chemical modification of sugar molecules at selected sites alters bonding properties and allows conclusions about stereospecific moieties within a sugar ring which elicit the sweet response.  $\beta$ -D-fructopyranose exists in the  $^4C_1$  conformation and can be converted to a stable derivative when water is intramolecularly eliminated. Anhydro sugars are formed under conditions of pyrolysis when foods are subjected to high temp., pressure and acidity, thus their sensory properties are of fundamental interest. Accordingly this paper describes some structural functions of taste in a number of anhydro derivatives. [See also FSTA (1975) 7 1L86.] IFT

## 3

**Will high fructose corn syrup sweeten your future?**

Robinson, J. W.

*Food Engineering* 47 (5) 57-61 (1975) [En] [A.

E. Staley Manufacturing Co., Decatur, Illinois, USA]

High-fructose corn syrup is similar to sucrose syrup in sweetness and has a relatively low viscosity. It is produced by a multistage starch conversion process in which part of the resultant dextrose is enzymically isomerized to fructose. On a dry basis, the syrup contains 42% fructose, 50% dextrose and 8% higher saccharides; solids content is 71%. This paper pinpoints those foods and beverages in which high-fructose corn syrup can

totally or partially replace invert syrup or sucrose, and discusses effects on product functionality and quality. Foods and beverages discussed are: still and carbonated soft drinks; frozen desserts and related dairy products, e.g. ice-cream; chocolate milk and fruit-flavoured beverages; baked goods and snacks; sugar confectionery; jams, jellies and preserves; pickles and relishes; canned fruits; pie fillings; salad dressings and sauces; and catsup. Factors to consider in replacing sucrose or invert syrup with high-fructose corn syrup include: differences in sweetness; effects due to reducing sugars; texture and other physical properties; and possible need for changes in storage and handling methods. The high fructose syrup must be stored at 85-95°F to prevent crystallization and colour development. JA

## 4

**Preparation of optically active 6-chlorotryptophan and tryptophan.**

Yamada, S.; Yamamoto, M.; Hongo, C.; Chibata, I. *Journal of Agricultural and Food Chemistry* 23 (4) 653-657 (1975) [14 ref. En] [Res. Lab. of Applied Biochem., Tanabe Seiyaku Co. Ltd., 16-89 Kashima-3-chome, Yodogawa-ku, Osaka, Japan]

Optical resolution of racemic modifications of 6-chloro-DL-tryptophan and DL-tryptophan was studied in order to develop practical methods for the production of 6-chloro-D-tryptophan, a non-nutritive sweetening agent, and L-tryptophan, an essential amino acid. 6-Chloro-DL-tryptophan methanesulphonate and DL-tryptophan p-phenol-sulphonate were resolved by preferential crystallization procedures. High yields of optically pure isomers of both amino acids were obtained. Industrial production of the isomers by these methods is considered promising if the appropriate synthetic methods for production of the racemic modifications are developed. AS

## 5

**Dihydrochalcone xylosides and their use as sweetening agents.**

Horowitz, R. M.; Gentili, B. (United States of America, Secretary of Agriculture)

*United States Patent* 3 890 298 (1975) [En]

## 6

**Dihydrochalcone galactosides and their use as sweetening agents.**

Horowitz, R. M.; Gentili, B. (United States of America, Secretary of Agriculture)

*United States Patent* 3 890 296 (1975) [En]







7

[Xylitol as a sugar substitute.] Zur Bedeutung des Zuckeralkohols Xylit als Zuckeraustauschstoff. Grütte, F.-K.; Rödel, H.

*Ernährungsforschung* 20 (3) 74-79 (1975) [De] [Zentralinst. für Ernährung, Potsdam-Rehbrücke, German Democratic Republic]

The suitability of xylitol for use as a sugar substitute is discussed, with reference to its sweetness, solubility, crystallization characteristics, physicochemical properties, processing characteristics, toxicology and digestibility. Use of xylitol in bakery products, chocolate products and soft drinks (especially those for diabetics) is discussed, with reference to effects on organoleptic properties. Xylitol (which is fully digestible) is not suitable for use in calorie-reduced foods. IN

8

[Determination of saccharin and benzoic acid in alcoholic beverages.]

Albano, V.; Dvinola, V.

*Bollettino dei Laboratori Chimici Provinciali* 26 (7) 257-259 (1975) [3 ref. It, de, en, fr] [Lab. Chim. Provinciale, Salerno, Italy]

A simple method (chromatography on acid silica gel) for separating saccharin from benzoic acid is described. Elution with petroleum ether/ethyl ether (8:2) isolates all the benzoic acid, and elution with ethyl ether/methanol (9:1) all the saccharin present. Benzoic acid is determined by UV absorbance at 226 nm, saccharin at 287 nm. Analysis of many commercial samples gave practically complete recoveries of benzoic acid and 95% recoveries of saccharin. RM

9

[Frankonia xylitol chocolate in caries tests.]

Frankonia-Xylit-Schokoladen im Karies-Test. Janicki, K.

*Süßwaren* 19 (9) 324, 326, 328 (1975) [De]

The suitability of xylitol for use as a sugar substitute in confectionery (including chocolate) is discussed, with reference to: the lack of cariogenic activity of xylitol; its sweetness (approx. equal to that of sucrose); its stability at temp.  $\leq 180^\circ\text{C}$ ; its lack of Maillard reactions with proteins; effects on the aroma and flavour of confectionery; its fermentability by moulds and bacteria (but not yeasts); and the firmness of xylitol/pectin/acid jellies. Xylitol is at present permitted only in dietetic products. IN

10

The sweetener revolution comes to Britain.

Dingwall, A. L.; Campbell, H.

*Soft Drinks Trade Journal* 29 (9) 315-316 (1975) [En]

Consideration is given to the following: the history of glucose syrups; the manufacture, properties and uses of high-fructose glucose syrup; and the effectiveness of this sweetener in squashes and carbonated drinks. VJG

11

Pure fructose.

Longden, P. J.

*Soft Drinks Trade Journal* 29 (10) 354-355 (1975) [En]

The difference between pure fructose and high-fructose glucose syrups, the history of their use as sweeteners, and properties and application, with particular reference to the soft drinks industry, are briefly outlined. VJG

12

Sugar alternatives in bread and rolls.

Jackel, S. S.

*Bakery Production and Marketing* 10 (4) 66-68, 70 (1975) [En]

Developments in the formulation of alternatives to sugar for use in the bread and roll baking industry are discussed, with special reference to: corn syrups, liquid dextrose, fructose-containing corn-syrups, pre-gelatinized starch, dried honey products, pre-gelatinized cornflour, and a whey product. A no-sugar formula developed by Pomeranz & Finney at the USDA laboratory in Manhattan (Kansas) is discussed. AA

13

[The sugar substitute xylitol, and its importance in prophylaxis of caries.] Der Zuckeraustauschstoff Xylit und seine Bedeutung in der Kariesprophylaxe. Gehring, F.; Karle, E.

*Süßwaren* 19 (9) 330, 333-336, 338-340 (1975)

[26 ref. De] [Lehrstuhl für Experimentelle Zahnheilkunde, Univ., Würzburg, Federal Republic of Germany]

Comparative studies (in rats) on the cariogenic activity of chocolate containing (i) sucrose or (ii) xylitol are discussed. The results show that the dental plaque of animals receiving (i) had very high counts of *Streptococcus mutans*, which forms lactic acid (which dissolves the dental enamel); the dental plaque of animals receiving (ii) contained low counts of *S. mutans*. It is suggested that (ii) inhibits growth of *S. mutans*. Dangers of assuming that these observations are also applicable to humans are briefly discussed. IN

14

Synthesis and taste of some dihydrochalcone glycosides.

Esaki, S.; Kamiya, S.; Konishi, F.

*Agricultural and Biological Chemistry* 39 (7) 1385-1389 (1975) [9 ref. En] [Food Chem. Lab., Shizuoka Wome's Univ., Yada 409, Shizuoka City, Japan]

Hesperetin-7- $\beta$ -maltoside, -7- $\beta$ -cellobioside and -7- $\beta$ -lactoside were prepared by coupling of hesperetin with  $\alpha$ -acetobromo derivatives of appropriate disaccharides, followed by saponification. The first named was as sweet as glucose. Naringenindihydrochalcone-4'- $\beta$ -







sophoroside, -4'-[ $\beta$ -D-glucosyl (1 $\rightarrow$ 2)  $\beta$ -D-galactoside] and also hesperetindihydrochalcone-4'- $\beta$ -kojibioside, -4'- $\beta$ -maltoside, -4'- $\beta$ -cellobioside and -4'- $\beta$ -lactoside were prepared by catalytic reduction of appropriate flavanone-7- $\beta$ -glycosides in alkaline medium. Their relative sweetness values, are discussed in comparison with dihydrochalcones of naringin and neohesperidin. AS

## 15

### Flavor modification.

Fennel, J. R.; Harvey, R. J. (Mirlin Corp.)  
*United States Patent* 3 898 323 (1975) [En]

An effervescent flavour modification composition contains the taste modifying principle for suppressing sour taste and enhancing sweet and salt taste found in and obtained from the ripe fruit of *Synsepalum dulcificum* Daniell. IFT

## 16

### [Method for preparing sweeteners.]

Unilever NV

*Netherlands Patent Application* 7 412 991 (1975) [NI]

Granular sweetener compositions having approx. the same sweetening power/unit vol. and a caloric value of <66.6% that of crystal sugar are based on a water-soluble non-sweetening polysaccharide (e.g. maltodextrin or related starch hydrolysates) in the form of a glassy matrix into which is incorporated a dissolved sweetener without nutritional value (e.g. saccharin, cyclamate and/or their Ca or Na salts) and 50-60% by wt. of powdered sugar particles. The sweetener composition is produced by vacuum-drying a suspension of fine sugar particles in an aqueous solution of the non-sweetening polysaccharide and sweetener. A brittle, glass-like foam is obtained which is comminuted. A product having the desired particle size and a bulk wt. of preferably 0.33-0.45 g/cm<sup>3</sup> is subsequently separated out. W&Co

## 17

### Molasses - a new look at a natural sweetener.

Balke, W.

*Food Product Development* 9 (5) 48, 50 (1975) [En] [Speciality Products by SuCrest, New York City, New York, USA]

A description is given of the use of molasses in baking and confections. Technical aspects of molasses considered are: its function as a natural colorant, as a source of salt, as a source of sugar, as a natural flavouring, and as a nutrient source. Speciality Products by SuCrest has incorporated these natural properties of molasses in a dry, powdered, free-flowing product called DRI-FLO dried molasses. VJG

## 18

### Corn sweeteners: more than an alternative?

Jackel, S. S.

*Bakery Production and Marketing* 10 (9) 100-101, 104-105 (1975) [En]

High fructose corn syrups (HFCS) and their

usefulness to bakers are discussed. In-bakery conversion would be a method of avoiding one of the limitations of HFCS, i.e. that they must be transported and stored warm to prevent crystallization. This conversion could be achieved by immobilized enzyme techniques. A typical HFCS is reported to contain 50% dextrose, 42% fructose, 2.5% maltose, 1.8% iso-maltose and 3.7% higher sugars; specification: 36.7°Baume, 28.7% moisture, 71.0% sweetener solids, pH 4.3, clear colour, bland taste, 11.1 lb/gal, 7.9 lb solids/gal, and suitable for lb for lb replacement of invert sugar. HFCS can also be used as 100% sucrose replacement in bread, rolls, sweet goods, Danish pastries, pie fillings and jellies. JRR

## 19

### The safety evaluation of food additives: the dynamics of toxicological decision. [Review]

Vettorazzi, G.

*Lebensmittel-Wissenschaft + Technologie* 8 (5) 195-201 (1975) [28 ref. En] [Food Additives (Food Safety) Unit, WHO, CH-1211 Geneva 27, Switzerland]

A historical outline is presented to permit identification and location of the scopes and motives which initiated the present activities of the FAO/WHO Expert Committee on Food Additives. These activities are discussed with particular regard to the information required for toxicological evaluation, the dynamics of toxicological decisions and the resulting administrative overtones. The safety assessment of food additives is conceived as representing a flow-process by which the toxicological methodology leads to the design of appropriate investigations which ought to supply adequate information. This information, after proper interpretation, could assist in the formulation of toxicological decisions which should provide a reasonable basis for regulations on the safe use of intentional and unintentional food additives. The role of food science and technology is discussed not only with regard to its contributions to the process of safety evaluation, but to the increasing awareness of modern food science to the importance of toxicological decisions. AS

## 20

### Cyclamate and saccharin okay, NAS forum told.

Gibney, L.-Y. C.

*Chemical and Engineering News* 53 (14) 14-15 (1975) [En] [Chem. & Eng. News, 1155 16th Street NW, Washington, DC 20036, USA]

Studies are reported concerning the safety of cyclamate and saccharin, and urging their reinstatement as sweeteners. AL

## 21

### BIBRA study answers questions on cyclamate toxicity.

Anon.

*Food Product Development* 9 (5) 44 (1975) [En]

The primary and/or secondary effects of cyclohexylamine (CHA) on the testes of Wistar and Sprague Dawley rats were investigated. Groups of 25 rats were treated with 600, 2000 and 6000 ppm







CHA in the diet for 90 days. All rats survived the treatment but those in the high dosage groups were the only ones having significantly decreased sperm counts, with sperm motility reduced in Sprague-Dawley rats and sperm morphological abnormalities in Wistar rats. Statistical data indicate that significant testicular effects occurred only in the high dosage groups (6000 ppm) for both strains. There was no statistical evidence of testicular effects in the low (600 ppm) or mid-dosage (2000 ppm) groups of either strain. Extrapolation of CHA effects in these rat studies to humans is difficult. Taking the body load of CHA for the 2000 ppm groups as the no-effect level (dosages at this level ranging from 100 to 227 mg/kg/day) and comparing these dosage with the human exposure to CHA of 10 mg/kg/day, as indicated by the study on 750 human subjects, a safety factor of 10 to 22.7 is apparent. VJG

## 22

[Determination of saccharin by gas chromatography after methylation with diazomethane.] Zur gaschromatographischen Bestimmung von Saccharin nach Methylierung mit Diazomethan. Unterhalt, B.

*Zeitschrift für Lebensmittel-Untersuchung und -Forschung* 159 (3) 161-164 (1975) [8 ref. De, en] [Fachbereich Pharmazie und Lebensmittelchemie, Univ., Marburg/Lahn, Federal Republic of Germany]

It is pointed out that in saccharin methylation with diazomethane, The O-methyl ether of saccharin is formed together with (i) N-methylsaccharin, but that it is largely converted into (i) at the 185°C temp. applied is subsequent GLC determination. [See FSTA (1971) 3 4H557.] SKK

## 23

Work on new synthetic sweeteners advances. Seltzer, R. J.

*Chemical and Engineering News* 53 (34) 27-28 (1975) [En] [Chem. & Eng. News, 1155 16th Street NW, Washington, DC 20036, USA]

Recent developments on new sweeteners are discussed. They include: neohesperidin dihydrochalcone; an aldoxime sweetener, 4-(methoxymethyl)-1,4-cyclohexadiene-1-carboxaldehyde, syn-oxime, which has 450 times the sweetening power of sucrose without the off-taste of saccharin; and Dynapol, a non-absorbable, non-nutritive, water-soluble, polymer-bound sweetener. AL

## 24

Synthesis and tastes of some flavanone- and dihydrochalcone glycosides.

Kamiya, S.; Esaki, S.; Konishi, F.

*Agricultural and Biological Chemistry* 39 (9) 1757-1762 (1975) [9 ref. En] [Food Chem. Lab., Shizuoka Women's Univ., Yada 409, Shizuoka City, Japan]

## 25

Preferences for sweet and salty in 9- to 15-year-old and adult humans.

Desor, J. A.; Greene, L. S.; Maller, O.

*Science, USA* 190 (4215) 686-687 (1975) [11 ref. En] [Monell Chem. Senses Cent., Univ. of Pennsylvania, Philadelphia, Pennsylvania 19104, USA]

Preferences for the tastes of sucrose, lactose and NaCl were measured in 618 subjects aged 9-15 yr and in 140 adults. The younger subjects preferred greater sweetness and saltiness than did the adults. In the younger group, there were race and sex differences in preferences, none of which appeared among the adults. AS

## 26

High fructose syrups - new sweeteners in the food industry. [Review]

Barker, S. A.

*Process Biochemistry* 10 (10) 39-40 (1975) [14 ref. En] [Dep. of Chem., Univ. of Birmingham, UK]

A review is given of developments in the production of synthetic invert sugar. AS

## 27

[Natural sweeteners; development, functional property, and application.]

Han, M. H.

*Korean Journal of Food Science and Technology* 6 (4) 241-248 (1974) [31 ref. Ko]

## 28

Sweetening agent.

Suarez, T.; Kornfeld, E. C.; Sheneman, J. M. (Eli Lilly & Co.)

*United States Patent* 3 899 592 (1975) [En]

Low caloric sweetening compositions comprising the D-enantiomorph of a 6-substituted tryptophan. IFT

## 29

[Low caloric sweeteners.]

Hayashibara, K.

*Japanese Patent* 5 022 105 (1975) [Ja]

A wide variety of low caloric foods and beverages is sweetened by incorporation of iso-maltitol or iso-maltosyl-sorbitol. IFT

## 30

[Synthetic sweetener.]

Sanei Chemical Industry Co. Ltd.

*Japanese Patent* 5 025 018 (1975) [Ja]

Sweetening agents analogous to cane sugar and free from bitterness are prepared by homogeneously mixing saccharin, dulcin, cyclamine or the like with at least twice the amount of a decomposed starch derivative such as a starch modified by amyloysis; heating the mixture to solidify it; and subsequently grinding. IFT







## 31

**Non-cariogenic foods and delicacies containing xylitol as a sugar substitute.**

Bohni, E. (Hoffman-La Roche Inc.)

*United States Patent* 3 914 434 (1975) [En]

## 32

**Structure-taste relationship of some sweet-tasting dipeptide esters.**

Brussel, L. B. P.; Peer, H. G.; Heijden, A. van der  
*Zeitschrift für Lebensmittel-Untersuchung und -Forschung* 159 (6) 337-343 (1975) [15 ref. En, de] [Unilever Res. Duiven, Zevenaar, Netherlands]

A method described for predicting whether a dipeptide ester is sweet or not uses atomic models and is based on detn. of the size, length and shape of the side chain (R) of the amino acid ester attached to L-aspartic acid. Data for 28 dipeptide esters were evaluated. 21 were sweet; the size and length of the side chains could be correlated with degree of sweetness. An ester is sweet provided the length of the side chain (R) is between 0.48 and 0.88 nm, and its size  $\geq 2.9$  nm; as for the shape of R in sweet esters, there were 2 max. in space filling at about 0.2 and 0.4 nm or about 0.3 and 0.5 nm from the asymmetric C atom. AS

## 33

**Maltitol powder.**

Hiraiwa, T. (Nikken Chemicals Co.)

*United States Patent* 3 918 986 (1975) [En]

A low caking composite maltitol powder contains core particles  $>50\%$  by wt. of maltitol and a coating of fine saccharide particles with a diam.  $< \frac{1}{4}$  the diam. of the core particles. IFT

## 34

**The quantitative determination of ortho-toluene sulfonamide (o-TS) in saccharin by UV spectrophotometry and by gas chromatography.**

Jacin, H.

*Deutsche Lebensmittel-Rundschau* 71 (12) 428-429 (1975) [2 ref. En, de, fr] [Life Savers Inc., Port Chester, New York 10573, USA]

A UV spectrophotometric method for detn. of the impurity o-toluene sulphonamide (o-TS) in saccharin is described. 2.0-10.0 g sodium saccharin is dissolved in 15 ml of a 0.5% solution of  $\text{Na}_2\text{HPO}_4$ ; the solution is transferred to a separation funnel, and 20 ml methylene chloride are added. The funnel is shaken, and the lower (methylene chloride) layer is drained off and dried with anhydrous sodium sulphate. The extract is then evaporated to dryness, the residue is taken up in absolute ethanol, made up to 10 ml, and its absorbance is read against an ethanol blank at 269 nm. A GLC method for detn. of o-TS in saccharin is also described, differing from other published methods in that the o-TS is determined as the trimethylsilyl derivative. 8 samples of sodium saccharin and 2 samples of acid saccharin were analysed by the above methods, and also by the GLC method used at the Batelle Memorial Laboratory, Columbus, Ohio. A table of results is

given. Results of analyses by the 3 methods studied generally agreed well. Sensitivity of the UV spectrophotometric method is 0.01 mg o-TS/ml; sensitivity of the GLC method is 0.1  $\mu\text{g}$  o-TS/ $\mu\text{l}$ . Slight interference by p-toluene sulphonamide was observed with the UV spectrophotometric method. AJDW

## 35

**The tastes of artificial sweeteners and their mixtures.**

Moskowitz, H. R.; Klarman, L.

*Chemical Senses and Flavor* 1 (4) 411-421 (1975) [18 ref. En] [Food Sci. Lab., US Army Natick Lab., Natick, Massachusetts, USA]

Panels scaled the taste intensity (bitterness, sweetness) of artificial sweeteners, mixtures of artificial sweeteners, and glucose. Sweetness of glucose conformed to a power function, whereas neither sweetness of artificial sweeteners nor their bitterness did. The total taste intensity of mixtures was often lower than the taste intensities of the components, suggesting suppression, although in many instances the suppressive effects disappeared at high concn. AS

## 36

**The hedonic tones of artificial sweeteners and their mixtures.**

Moskowitz, H. R.; Klarman, L.

*Chemical Senses and Flavor* 1 (4) 423-429 (1975) [9 ref. En] [Food Sci. Lab., US Army Natick Lab., Natick, Massachusetts, USA]

Panels rated their liking or disliking of aqueous concn. of glucose, sodium and calcium cyclamate, sodium and calcium saccharin, and pairwise mixtures of artificial sweeteners at varying concn. Hedonic tones did not add arithmetically; the unpleasantness of a mixture was often substantially more than the unpleasantness of the components. Adequate predictions of hedonic tones of mixtures must be made by referring back to the taste qualities of the mixture. This necessity for intermediate steps (i.e. consideration of the sensory aspect) constrains considerably the development of models which predict mixture hedonics from the hedonics of the mixture components evaluated separately. AS

## 37

**Structural functions of taste in the sugar series: binding characteristics of disaccharides.**

Lee, C.-K.; Birch, G. G.

*Journal of the Science of Food and Agriculture* 26 (10) 1513-1521 (1975) [23 ref. En] [Nat. Coll. of Food Tech., St. George's Avenue, Weybridge, Surrey, UK]

The previous finding [see FSTA (1975) 7 1L86] that only one half of a disaccharide molecule binds to the taste receptor site was fully substantiated but the linkage and the sugar residues of the disaccharide are important. The study was extended to the field of bitterness and it was observed that binding on to the bitter receptor is analogous to





that on to the sweet receptor. With reducing disaccharides, it is the non-reducing glycosyl unit that binds to the taste bud protein. Therefore, oligosaccharides constitute ideal models for this study despite their free anomeric centres. AS

## 38

### Sweetness inducer.

Lee, C.; Scarpellino, R. J.; Murtagh, M. M. (General Foods Corp.)

**United States Patent** 3 916 028 (1975) [En]

Compositions of salts of chlorogenic acid, cynarin, isochlorogenic acid, neochlorogenic acid or combinations of these, particularly amine, Na, Hg, K, Ca, Fe and  $\text{NH}_3$  salts, are used in liquid or dried form to impart a sweet taste to non-sweet or semi-sweet foods and beverages. GL

## 39

### Xylitol: new natural sweetener.

Anon.

**Manufacturing Confectioner** 55 (11) 29 (1975) [En]

Unpublished results concerning the anticariogenic properties of xylitol are discussed, and the potential of this pentose sugar as a confectionery sweetener is considered. JRR

## 40

### Determination of saccharin, sodium benzoate, and caffeine in beverages by reserve phase high-pressure liquid chromatography.

Smyly, D. S.; Woodward, B. B.; Conrad, E. C. **Journal of the Association of Official Analytical Chemists** 59 (1) 14-19 (1976) [12 ref. En] [Div. of Chem., Florida Dep. of Agric. & Consumer Services, Mayo Building, Tallahassee, Florida 32304, USA]

A reverse phase high-pressure liquid chromatographic method is presented for the simultaneous separation and detn. of saccharin, sodium benzoate, and caffeine in soft drinks, fruit juices, fruit cocktails, fruit punches, coffee, and artificial sweetener concentrates. Decarbonated soft drinks, fruit punches, and artificial sweetener concentrates are injected directly into the chromatograph. Fruit juices and coffee solutions require filtration through a  $0.45 \mu\text{m}$  membrane filter prior to injection. Samples are eluted from a  $\mu$ -Bondapak/ $\text{C}_{18}$  column with 5% glacial acetic acid and are quantitated with an UV detector. The results of saccharin, sodium benzoate, and caffeine detn. in 34 soft drinks (representing 11 manufacturers and 20 flavours); 8 fruit juices, cocktails, and punches; 7 coffees; and 6 artificial sweetener concentrates are presented. Average recoveries of saccharin, sodium benzoate, and caffeine from soft drinks are 99.0, 99.3, and 100.2%, respectively. AS

## 41

### Sweetness and sweeteners.

Birch, G. G.

**Bulletin. British Nutrition Foundation** No. 12, 23-30 (1974) [12 ref. En] [Nat. Coll. of Food Tech., Weybridge, Surrey, UK]

The relative sweetness of some common and rare food sugars and their molecular ring structure, the greater sweetness of some artificial sweeteners compared with sucrose, nutritional aspects of sweeteners, and natural sweetening agents are discussed. AL

## 42

### Engineering 'sugar'.

Godzicki, M. M.

**Food Engineering** 47 (10) EF12-EF13, EF16-EF17 (1975) [En] [Corn Products, Int. Plaza, Englewood Cliffs, New Jersey 07632, USA]

This discussion of combination sweeteners (generally combinations of sucrose and corn-derived products) covers the various types and forms of sucrose and corn sweetener available, e.g. liquid sucrose, crystalline sucrose, invert sugar, dextrose, corn syrups; combination of sucrose and corn products to achieve a wide range of properties, e.g. sweetness, viscosity; preblended combinations prepared by sweetener manufacturers and postblends prepared at the point of use; production and application of high-fructose corn syrups; and applications of combination sweeteners, e.g. in carbonated and non-carbonated beverages, pie fillings, apple sauce. Tables list 22 combination sweeteners, their applications and analytical data, e.g. % solids, sucrose, reducing sugars and ash, pH, colour, and density. JA

## 43

### Some other sweeteners.

Anon.

**Food Processing** 36 (11) 26-28 (1975) [En]

The uses and characteristics as sweeteners of fructose, dihydrochalcones, aspartame, cyclamates, saccharin and thalose are briefly described. JRR

## 44

### [Determination of saccharin in food by high speed liquid chromatography.]

Tanaka, Y.; Ikebe, K.; Tanaka, R.; Kunita, N. **Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi]** 16 (5) 295-300 (1975) [13 ref. Ja, en] [Osaka Pref. Inst. Public Health; 3-69, Nakamichi 1-chome, Higashinari-ku, Osaka, Japan]

A commercially available anion exchange column Permaphase AAX was employed with an aqueous buffered mobile phase. Five  $\mu\text{l}$  of a prepared solution containing 1-7 mg saccharin and 2.5 mg salicylic acid as internal standard/5 ml of the solution was injected into a Pont (830 type) high speed liquid chromatograph with a UV





absorption detector (254 nm). The analytical procedures in this method were simpler than those in gas chromatography. The detection limit of saccharin was 0.1 µg, and recovery was >95%. The method was found to be practicable for the rapid analysis of saccharin in foods. TM

## 45

[Salts of N-(cyclopentylmethyl) sulphamic acid with sweetening properties, and their preparation.]

Nofre, C.; Pautet, F.

**French Patent Application** 2 254 282 (1975) [Fr]

Sulphamate compounds containing a cycloparaffin group and in which X in the  $-SO_3X$  group is a cation, preferably  $Na^+$ ,  $Ca^{2+}$ , or  $H^+$  have sweetening properties and are suitable for inclusion in foods, drinks and confectionery products. Sodium cyclopentylmethyl sulphamate was evaluated using a tasting method and had a sweetening power in aqueous solution approx.  $60 \times$  that of sucrose, (on a wt. basis). The sweetening power is therefore similar to that of cyclamates, but metabolic breakdown of these compounds yields an aliphatic amine, unlike the cyclamates, which yield aromatic and alicyclic amines which have been shown to be carcinogenic. W&Co

## 46

[Salts of L-alanine tertiary butyl amide with sweetening properties, and their preparation.]

Nofre, C.; Tinti, J.-M.; Pautet, F.

**French Patent Application** 2 254 283 (1975) [Fr]

Compounds having the general structure of a tertiary butyl amide of alanine and a terminal XH group where XH is an organic or inorganic acid, preferably hydrochloric or sulphuric, have been found to have an intensely sweet flavour which makes them suitable for inclusion in foods, drinks and confectionery products. L-Alanine tertiary butyl amide hydrochloride was evaluated using a tasting method, and found to have a sweetness  $210 \times$  greater than sucrose and  $3.9 \times$  greater than sodium cyclohexylsulphamate (on a wt. basis). W&Co

## 47

[Determination of saccharin by gas chromatography.]

Hoshino, Y.; Suzuki, T.; Kikuchi, Y.; Nose, N.; Watanabe, A.

**Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi]** 16 (3) 182-186

(1975) [6 ref. Ja, en] [Saitama Inst. Public Health, Kamiookubo-higashi, Urawa-shi, Saitama-ken, Japan]

Saccharin was methylated with dimethylformamide dimethylacetal and heated at  $110^\circ C$  for 30 min. The methyl derivative was determined by GLC with recoveries of 88-94%. The limit of detection of saccharin was discussed. TM

## 48

[Determination of sodium saccharin in food by UV spectrophotometry.]

Nakamura, M.; Watanabe, K.; Kirigaya, T.; Yazawa, Y.; Watabe, A.; Suzuki, Y.; Kawamura, T. **Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi]** 16 (4) 264-270 (1975) [11 ref. Ja, en] [Yokohama, City Inst. of Health, Takigashira 1-chome, Isogo-ku, Yokohama, Japan]

The proposed simple method for determination of saccharin sodium in foods was as follows. Saccharin sodium is converted to 1,2-benzisothiazolin-1,2-dioxide by reduction with Zn and HCl. The reduced product shows absorption at 258, 264 and 171 nm under UV irradiation. The min. limit of detection in prepared solutions was 10 ppm as saccharin sodium. TM

## 49

• Sweetness inducer.

Lee, C.; Scarpellino, R. J.; Murtagh, M. M. (General Foods Corp.)

**United States Patent** 3 924 017 (1975) [En]

A sweetness inducing composition for foods and beverages comprises an alkaline earth, Na-,  $NH_3$ - or Fe-based salt, or combination of salts, of chlorogenic acid, caffeic acid, cyanarine, neochlorogenic acid and isochlorogenic acid. These stable salts are ideal for incorporation into products, e.g. chewing gum, where a longer lasting sweetness is desired. It is possible that a freeze-dried form of the composition could be incorporated into medicinal lozenges to mask any unpleasant taste. GL

## 50

[Sweeteners. The legal position of sweeteners in various countries.]

Botma, Y.

**Voedingsmiddelentechnologie** 8 (43) 42-45 (1975) [NI]

## 51

The sweet taste.

Kare, M. R.; Beauchamp, G.

**Abstracts of Papers, American Chemical Society** 171 (Centennial), CARB 56 (1976) [En] [Monell Chem. Senses Cent., Univ. of Pennsylvania, 3500 Market Street, Philadelphia, Pennsylvania 19104, USA]

Topics covered include: the mechanism and functions of taste; the nature of taste response to sweet stimuli in the newborn, the adolescent, and aged; and the significance of differences in response to various sweet stimuli amongst species. AS





## 52

**Economic factors affecting future sweetener consumption.**

Kolodny, S.

*Abstracts of Papers, American Chemical Society*  
171 (Centennial), CARB 58 (1976) [En] [Amstar Corp., 1251 Avenue of the Americas, New York 10020, USA]

## 53

**Economics of sweeteners: production and demand consideration.**

Bohall, R. W.; Little, T. W.

*Abstracts of Papers, American Chemical Society*  
171 (Centennial), CARB 46 (1976) [En]  
[USDA, Room 200, 500 - 12th St., SW,  
Washington, DC 20250, USA]

## 54

**Factors determining recent distribution and marketing trends of sweeteners in the USA.**

Bollenback, G. N.

*Abstracts of Papers, American Chemical Society*  
171 (Centennial), CARB 49 (1976) [En] [Sugar  
Ass. Inc., 1511 K Street, NW, Washington, DC  
20005, USA]

## 55

**Patterns of consumption of sweeteners.**

Meiss, A. N.; Cantor, S. M.

*Abstracts of Papers, American Chemical Society*  
171 (Centennial), CARB 59 (1976) [En] [S. M.  
Cantor Ass. Inc., Haverford, Pennsylvania 19041,  
USA]

Increasing usage of corn-derived sweeteners, the advent of isomerized (high-fructose) corn syrups, and more extensive use of non-nutritive sweeteners have created significant changes in the US sweetener system. These changes are reflected in available sweetener source and delivery information, which are described and projected. However, delivery data raise certain questions related to the narrowing discretionary limits of sweetener choice and availability of real sweetener consumption data. Current efforts underway to provide answers to such questions are assessed.  
AS

## 56

**The Philip Lyle Research Laboratory.**

Vlitos, A. J.

*Chemistry and Industry* No. 6, 255-266 (1976)  
[53 ref. En] [Tate & Lyle Ltd., Group Res. &  
Development, PO Box 68, Reading, UK]

This paper deals with research at the Philip Lyle Research Laboratory. Following an introduction, topics dealt with are: Carbohydrate chemistry [sucrose], by R. Khan (pp. 255-258, 21 ref.); Microbial polysaccharides, by C. J. Lawson (pp.

258-261, 7 ref.); Fermentation, by R. C. Righelato (pp. 261-262, 1 ref.); Natural protein sweeteners [serendipity berry and katemfe], by J. D. Higginbotham (pp. 262-263, 6 ref.); Biology and agriculture, by J. Coombs (pp. 263-265, 9 ref.); Enzyme technology, by C. Bucke (p. 265, 6 ref.); and Sugar technology, by W. M. Nicol & M. B. Inkson (pp. 265-266, 3 ref.). AL

## 57

**An automated, liquid-chromatographic system for the analysis of carbohydrate mixtures.**

Scobell, H. D.; Brobst, K. M.; Steele, E. M.

*Abstracts of Papers, American Chemical Society*  
171 (Centennial), CARB 22 (1976) [En] [A. E.  
Staley Mfg. Co., Decatur, Illinois 62525, USA]

Dextrose, fructose, and related saccharides of commercial sweeteners are separated on cation-exchange resins with water as the eluant. The column systems described give rapid, high-resolution separations with a stable baseline, features which allow accurate and precise quantitation. All components of a sample are eluted from the columns, allowing quantitation on an area-normalized basis. No supporting analyses are required. Analysis time ranges from 5 to 30 min. The instrumentation described includes a custom-built, automatic, sample-injector/system controller, a conventional liquid-chromatograph, and a computing integrator. AS

## 58

**Sweetness of sucrose and xylitol. Structural considerations.**

Lindley, M. G.; Birch, G. G.; Khan, R.

*Journal of the Science of Food and Agriculture* 27  
(2) 140-144 (1976) [15 ref. En] [Nat. Coll. of  
Food Tech., Weybridge, Surrey, UK]

The sweetness of sucrose and xylitol is examined in relation to conformation and configuration. Arabitol, ribitol and the galacto and O-methyl analogues of sucrose are also examined on a comparative basis. The Shallenberger theory of sugar sweetness, which in part relates intensity of response to the degree of intramolecular H bonding, satisfactorily explains the high sweetness of these structurally dissimilar compounds. AS

## 59

**Sweetening composition and process therefor.**

Shoaf, M. D.; Pischke, L. D. (General Foods Corp.)

*United States Patent* 3 928 633 (1975) [En]

L-aspartyl-L-phenylalanine methyl ester (APM) is dispersed through a matrix created by melting a fuseable mass and subdividing it to encapsulate the APM. Free-flowing APM particles may be used with other powders. IFT





## 60

**Low calorie sweetener.**

Glicksman, M.; Wankler, B. N. (General Foods Corp.)

**United States Patent** 3 922 369 (1975) [En]

Low calorie sweetening compositions comprise freeze-dried mixtures of organic acids with lower alkyl esters of aspartylphenylalanine. IFT

## 61

**Present and future applications of immobilized enzymes in the sweetener industry.**

Zaborsky, O. R.

**Abstracts of Papers, American Chemical Society 171 (Centennial), CARB 47 (1976) [En] [Nat. Sci. Foundation, Washington, DC 20550, USA]**

Topics discussed include immobilized enzyme technology historical and technical developments of the glucose-isomerization system, and applications of immobilized enzymes to systems of commercial interest to the sweetener industry. AS

## 62

**Practical considerations for synthetic sweeteners.**

Beck, K. M.

**Food Product Development 9 (4) 47, 50, 52, 54 (1975) [16 ref. En] [Abbott Lab., N. Chicago, Illinois, USA]**

Consideration is given to sensory properties, chemical properties, physical properties and safety of synthetic sweetening agents. Properties and safety of the following sweeteners are considered: saccharin; cyclamate; aspartame; glycyrrhizin; and dihydrochalcones. VJG

## 63

**Sweetness measurement and the economics of sweetener mixtures.**

Moskowitz, H. R.; Toscano, V. A.

**Food Product Development 9 (6) 34, 36, 38, 40-42 (1975) [5 ref. En] [Food Sci. Lab., US Army Natick Development Cent., Natick, Massachusetts, USA]**

2 methods of measuring sweetness are described: (i) by magnitude estimation, and (ii) from empirically derived mathematical equations. Power functions for various sugars and acids evaluated by the method of magnitude estimation are tabulated. The evaluation of sweetener mixtures using mathematical equations is described. Estimates of synergy and partial additivity factors for sweetener mixtures summation model: sweetness mixture =  $k_m$  (sweetness of A + sweetness of B) are presented in tabular form for 21 components. An example is presented of the use of mathematical equations to solve a problem on the economics of sweetener mixtures i.e. the optimal blend for minimal cost (sweetness maintained), or the maximal sweetness (cost maintained). VJG

## 64

**[Determination of saccharin in foods by fluorometric method.]**

Nakamura, Y.

**Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi] 16 (6) 368-374 (1975) [6 ref. Ja, en] [Fukuoka Environmental Cent., Dazaifu-machi, Fukuoka-ken, Japan]**

Saccharin (50-400  $\mu$ g) in foods was extracted with ether and transferred to 1% sodium bicarbonate solution, which was acidified with sulphuric acid, aerated with warming to remove ether, and treated with potassium permanganate to remove coexisted substances. The fluorescence of saccharin was determined at 410 nm, exciting at 277 nm after treatment with ammonia water. The recovery of saccharin was 82-98%. TM

## 65

**Low calorie sweetener.**

Furda, I.; Trumbetas, J. F. (General Foods Corp.)

**United States Patent** 3 934 048 (1976) [En]

An aqueous solution of maltose or dextrins is heated to completely solubilize the carbohydrate and a catalytic amount of phosphoric acid is added to bring about polymerization. The acidified carbohydrate syrup is vacuum dried to obtain a polymer residue which is combined with a dipeptide sweetener and dried to yield a low calorie sweetening composition devoid of after taste. IFT

## 66

**[Lactose: description of a raw material with examples of technical uses.] Milchzucker-Bild eines Rohstoffs mit anwendungstechnischen Beispielen. Goller, H.-J.; Kube, J.**

**Industrielle Obst- und Gemüseverwertung 59 (23) 650-653 (1974) [11 ref. De]**

Preparation of lactose from milk, legal definition, properties, purity criteria, solubility, sweetening power, aroma-binding capacity, and suitability for diabetic are outlined. Uses of lactose in vegetable preservation, and for taste improvement of fruit preserves and jams are described. It is concluded from own experiments on inclusion of lactose in cherry jams (0-80 g/300 g fruit) that 10-15% of sucrose may be replaced by lactose without noticeable effect on sweetness; and a similar replacement of fructose by lactose in jams for diabetics is recommended. SKK

## 67

**Recent flavor developments. [Lecture]**

Mason, M. E.

**Activities Report 27 (2) 71-82 (1975) [En]**

This paper discusses the numbers of chemicals found in foods, illustrating the point by reference to the total numbers of chemicals identified in 10 different cooked foods (e.g. 450 in coffee); classes of chemicals on the FEMA (Flavor Extract





Manufacturers Association) GRAS lists and their numbers in each case, recent regulatory and legal developments; beverage sweeteners; replacement of 8, 16 or 21 % of meat by hydrated soy concentrate or spun protein, and the cost savings when replacing 20 or 40% meat in beef-type patties. [See FSTA (1976) 8 8G510.] AL

## 68

**Health laws and regulations - Uganda.**  
World Health Organization

*International Digest of Health Legislation* 26 (2) 418-424 (1975) [En] [Geneva, Switzerland]

A selection of Ugandan health laws and regulations is presented including the following which relates to food hygiene: Food and Drugs (Prohibition of the Use of Cyclamate) Regulations, 1971 (dated 1 Dec., 1971). VJG

## 69

**Diverse rules regulate cyclamate, saccharin abroad.**  
Weilenmann, B.

*Food Product Development* 9 (6) 14, 16 (1975) [En] [Int. Sweeteners Ass., Zurich, Switzerland]

Inconsistencies in the permitted use or restriction of use, of cyclamate and saccharin are discussed with particular reference to the regulations in Federal Republic of Germany, Switzerland, Austria, UK, Sweden, France, and USA. New consumption pattern i.e. a trend toward less sweetener consumption is considered. VJG

## 70

**Sweet: the special taste.**

Desor, J. A.

*Cereal Foods World* 21 (2) 69-70, 88 (1975) [10 ref. En] [Warner-Lambert Co., Milford, Connecticut, USA]

The observed fact that sweetness is a universally desirable quality, and one which both man and animals will seek independently of food and drink has been investigated; control of the preferred level of sweetness by an individual was shown not to be genetically or environmentally controlled among twins. Some age variation in preference was shown, the group 9-15 yr preferring more sweet lactose and sucrose solutions than adults. JRR

## 71

**Evidence for the proximity of sweet and bitter receptor sites.**

Birch, G. G.; Mylvaganam, A. R.

*Nature, UK* 260 (5552) 632-634 (1976) [17 ref. En] [Nat. Coll. of Food Tech., Univ. of Reading, Weybridge, Surrey KT13 0DE, UK]

Results of experiments on the perception of sweetness in (i) sucrose and (ii) methyl- $\alpha$ -D-mannopyranoside and of bitterness in (iii) quinine sulphate and (ii) both before and after presaturation of taste receptors with solutions of (iii) and (i) respectively are given. Results indicate that the bitter/sweet glycoside (ii) attaches itself by

a chelating action to the sweet and bitter receptor sites simultaneously. Presaturating the taste receptors with sweet or bitter molecules results in a lowered response. AL

## 72

**Fructose sweetness: a new dimension.**

Doty, T. E.

*Cereal Foods World* 21 (2) 62-63 (1976) [En] [Finnish Sugar Co. Ltd., Helsinki, Finland]

The possible applications of fructose as a sweetener are discussed, with reference to its greater sweetness relative to sucrose, the sweetness dependency on temp. and pH, synergism with saccharin, chemical activity (e.g. in Maillard reactions), solubility and hygroscopicity. The use of fructose in formulation of special, e.g. diabetic, diets is also mentioned. JRR

## 73

**Maltitol powder.**

Nikken Kagaku Co. Ltd.

*British Patent* 1 419 360 (1975) [En]

Cake resistant maltitol powders contain core particles of  $\geq 50\%$  maltitol coated with particles of a sugar alcohol. The composition is useful as low caloric sweeteners. IFT

## 74

**Chewing gum of longer lasting sweetness and flavor.**

Bahoshy, B. J.; Kose, R. E.; Nordstrom, H. A. (General Foods Corp.)

*United States Patent* 3 943 258 (1976) [En]

The normal sweetness and flavour of chewing gum compositions are extended by the incorporation of 0.3-1.5 wt. % methyl ester of L-aspartyl-L-phenylalanine. IFT

## 75

**Quantitative determination of saccharin in food products by ultraviolet spectrophotometry.**

Hussein, M. M.; Jacin, H.; Rodriguez, F. B.

*Journal of Agricultural and Food Chemistry* 24 (1) 36-40 (1976) [11 ref. En] [Life Savers Inc., Port Chester, New York 10573, USA]

A procedure for determination of saccharin in chewing gum and other food products [iced tea mix, carbonated soft drinks, saccharin tablets, conc. sweetener liquid] was developed. Saccharin is isolated by extracting the acidified sample solution with chloroform. The residue, after evaporation of the chloroform, is dissolved in 1%  $\text{Na}_2\text{CO}_3$  solution and absorbance is determined at 235 and 244 nm; the latter wavelength absorbance is to correct for any possible interference. Recoveries ranged from 83 to 113%. Analyses of commercial products of various brands gave 90-105% of label claim. AS





## 76

[Gas chromatographic determination of a micro amount of cyclamate by the method of trifluoroacetolysis of cyclamate.]

Nagasawa, K.; Shinozuka, T.; Ogama, A.  
*Journal of Hygienic Chemistry [Eisei Kagaku]* 20 (6) 337-340 (1974) [9 ref. Ja] [School of Pharmaceutical Sci., Kitasato Univ., 9-1 Shirokane, 5 Chome, Minato-Ku, Tokyo, Japan]

Trifluoroacetolysis was performed by heating sodium cyclamate in trifluoroacetic anhydride at 90° for 1 h. The reaction proceeded quantitatively to form N-trifluoroacetyl cyclohexylamine. The reaction was successfully applied to gas chromatographic determination of a micro-amount of sodium cyclamate in the range of 0.025-5 mg. HK

## 77

Cyclohexylamine and dicyclohexylamine concentrations in non-nutritive sweeteners and foods containing non-nutritive sweeteners.

Swallow, W. H.

*New Zealand Journal of Science* 18 (4) 541-546 (1975) [16 ref. En] [Chem. Div., Dep. of Sci. & Ind. Res., Christchurch, New Zealand]

Samples of sodium N-cyclohexylsulphamate (sodium cyclamate) produced by 7 manufacturers were analysed for the carcinogenic compound cyclohexylamine (present as a contaminant or a hydrolysis product); samples from 5 manufacturers were also analysed for dicyclohexylamine. Cyclohexylamine and dicyclohexylamine were also determined in 3 cyclamate-based non-nutritive sweetener formulations, and in 9 samples of beverages or jelly crystals (sweetened with cyclamates) for use by diabetics. In the sodium cyclamate samples, cyclohexylamine concn. ranged from not detectable to 9.0 mg/kg; no dicyclohexylamine was detected. In the non-nutritive sweetener preparations, cyclohexylamine concn. ranged from not detectable to 0.1 mg/kg; no dicyclohexylamine was detected. The cyclohexylamine concn. in the products for diabetics ranged from not detectable to 29.2 mg/kg; dicyclohexylamine was detected in only 1 sample (orangeade concentrate), at a concn. of 1.6 mg/kg. It is concluded that these products present no significant health hazard. AJDW

## 78

Chronic toxicity study of cyclamate-saccharin (10:1) in rats.

Oser, B. L.; Carson, S.; Cox, G. E.; Vogin, E. E.; Sternberg, S. S.

*Toxicology* 4 (3) 315-330 (1975) [29 ref. En] [Food & Drug Res. Lab. Inc., East Orange, New Jersey, USA]

The test mixture (10:1 cyclamate/saccharin) was fed at dietary levels designed to furnish 500, 1120, and 2500 mg/kg body wt. to groups of 35 male and 45 female rats. The protocol included observations of physical condition, growth response, food

efficiency, blood, urine, and post-mortem pathology. Since conversion to cyclohexylamine was found to occur in many of the rats, particularly in the higher dosage groups, it was included as an added insult in the diets of about half the animals during the last quarter of the 2-yr test period. Papillary carcinomas were found in the bladders of 12 of the 70 rats fed the max. dietary level of the mixture (equivalent to about 2500 mg/kg body wt.) for periods ranging from 78 to 105 wk (except for one earlier death). This finding was the principal reason for the removal of cyclamates from the "generally recognized as safe" (GRAS) group of non-nutritive sweeteners in the USA. In the opinion of the authors, the sequelae following this precipitate ban on cyclamates, prompted by a verbal report of the preliminary findings, warrant placing the study on record for the information of toxicologists and regulatory agencies throughout the world. AS

## 79

Sweetening composition.

Eisenstadt, M. E. (Cumberland Packing Corp.)

*United States Patent* 3 946 121 (1976) [En]

Sweetening compositions contain saccharine sweeteners, bicarbonates and a major proportion of glucono- $\delta$ -lactone. IFT

## 80

[Sweetening agent.]

Eisai Co. Ltd.

*Japanese Patent* 5 106 230 (1976) [Ja]

Low calorie sweetening compositions are obtained by combining glycyrrhizin with xylose and a citrate, a tartrate or succinate. IFT

## 81

Sweetening agents.

Newton, K.; Sale, A. J. H. (Lever Brothers Co.)

*United States Patent* 3 950 549 (1976) [En]

Low calorie sweetening compositions comprise solid sugar particles embedded in a glassy matrix of a bland polysaccharide and containing a non-nutritive sweetener. IFT

## 82

Dipeptide sweeteners.

Rousseau, P. M. (General Foods Corp.)

*United States Patent* 3 947 600 (1976) [En]

Dry foods are sweetened by coating with a foam containing a lower alkyl ester of L-aspartyl L-phenylalanine dipeptide sweetening compound. IFT

## 83

[Studies on decomposition of saccharin. I.]

Endo, F.; Handa, Y.; Hirokado, M.; Ishii, K.; Fujii, T.

*Annual Report of Tokyo Metropolitan Research Laboratory of Public Health* 24, 277-283 (1972, publ. 1973) [7 ref. Ja, en] [Div. of Food Additives, Dep. of Food Hygiene & Nutr., Tokyo Metropolitan Res. Lab. of Public Health, Tokyo, Japan]





A study was made of the influence of acids and alkalis on saccharin during heating under conditions used in food processing. Greatest decomposition (56.7%) occurred on boiling in 0.2N HCl for 240 min. Little decomposition occurred in boiling 0.2N acetic acid. [From En summ. and tables.] JA

## 84

**Quantitation of o- and p-sulfamoylbenzoic acids in commercial saccharin by high-performance liquid chromatography.**

Nelson, J. J.

*Journal of the Association of Official Analytical Chemists* 59 (2) 243-250 (1976) [23 ref. En] [FDA, 850 Third Avenue, Brooklyn, New York 11232, USA]

Quantitation of o- and p-sulfamoylbenzoic acid residues in saccharin and its sodium salt is achieved by a method comprising methanolic extraction and high-performance ion exchange chromatography. A commercially available anion exchange column was employed with an aqueous buffered (pH 9.2) mobile phase. As little as 80 ppm of the ortho-isomer and 25 ppm of the para-isomer can be accurately determined. The levels of detectability (2 times noise) are estimated as 8 ppm (0.16 µg on column) and 2.5 ppm (0.05 µg on column), respectively. Recoveries from saccharin ranged from 92.7 to 96.5% (ortho) and from 92.2 to 103.3% (para). Recoveries from the sodium salt ranged from 93.1 to 104.4% (ortho) and from 93.5 to 97.8% (para). Of 9 other potential saccharin impurities tested separately, only one was found to interfere slightly in the chromatographic part of the procedure. AS

## 85

**The future of fermentation technology in the food industry.**

Barnes, C. S.

*Food Technology in Australia* 28 (2) 55-57, 59, 61, 63-64 (1976) [29 ref. En] [CSR Res. Lab., Roseville, NSW, 2069, Australia]

Consideration is given to new fermentation products and the processes by which they are made. Products considered are: novel forms of protein; fats and carbohydrates; microbial polysaccharides; amino acids; synthetic sweeteners; food acids; and nucleotide food flavours. VJG

## 86

**Isomerase - the new natural sweetener.**

Anon.

*Confectionery Production* 42 (5) 232-234 (1976) [En]

Isomerase is a clear colourless liquid as sweet as invert sugar, which is known as high fructose corn syrup in the USA. Its preparation and properties are described. Suggested uses include: confectionery, bakery products, jams and preserves, and soft drinks. VJG

## 87

**Comparison of the sweetness of glucose and fructose with their ring-thio analogs.**

Lindley, M. G.; Shallenberger, R. S.; Whistler, R. L.

*Journal of Food Science* 41 (3) 575-577 (1976) [18 ref. En] [New York State Agric. Exp. Sta., Geneva, New York 14456, USA]

5-thio-α-D-glucopyranose and 6-thio-β-D-fructopyranose are shown to be significantly sweeter than α-D-glucopyranose and β-D-fructopyranose, respectively, when tasted in crystalline form. In solution, only the thio analogue of glucose is significantly sweeter than its parent sugar. The mutarotational formation of a nonsweet tautomer of thio-fructose in solution probably accounts for its fall in sweetness intensity. Reasons for the greater sweetness intensity of these thio analogues are proposed. 5-thio-β-D-fructofuranose is shown to be essentially tasteless. IFT

## 88

**[Gas-liquid chromatography determination of saccharin in foods as an N-methyl derivative.]**

Nagai, I.; Oka, H.; Tasaka, M.; Oka, A.

*Journal of Hygienic Chemistry [Eisei Kagaku]* 21 (5) 261-266 (1975) [8 ref. Ja] [Yamaguchi Prefectural Res. Inst. of Health, 5-67, Aoi, 2-chome, Yamaguchi-shi, Yamaguchi, Japan]

A new methylation method for GC detn. of saccharin was established. Saccharin was extracted from samples with ethyl acetate and converted to (i) N-methylsaccharin by reaction with dimethyl sulphate in acetone at room temp. for 10 min. After decomposition of dimethyl sulphate with sodium hydroxide, (i) in the solution was determined by GC using a column of SE-30 on Chromosorb W. Methyl palmitate was used as an internal standard. Rate of methylsaccharin formation from saccharin was 90.6-96.6%. This method gave good results when applied to the detn. of saccharin in several kinds of food and the recovery of saccharin added to food at the levels of 150 and 240 ppm was found to be 77.3-94.3%. HK

## 89

**Sweetener.**

Crosby, G. A.; Saffron, P. M. (Dynapol)

*United States Patent* 3 952 058 (1976) [En]

3-Amino-4-n-propoxybenzyl alcohol can be used as a non nutritive sweetener for foods and beverages. IFT

## 90

**1,4-Cyclohexadiene-1-carboxaldehyde syn-oxime synthetic sweetening agents.**

Acton, E. M.; Lerom, M. W.; Stone, H. (United States of America, Stanford Research Institute)

*United States Patent* 3 952 114 (1976) [En]





91

**Sweeteners - a study in regulatory lore.**

Becker, R. H.

*Food Product Development* 9 (9) 26, 28, 30 (1975) [En] [Kleinfeld, Kaplan & Becker, Washington, DC, USA]

Consideration is given to the unscientific traditions which affect the present regulatory status of sweeteners. The new FDA classification places food additives in 3 classes: affirmed as GRAS; approved for use under a food additive regulation; and disapproved or no longer permitted for food additive uses. The current regulatory status of sweeteners (sorbitol, sucrose, dextrose, fructose, aspartame, xylitol, cyclamate, saccharin and mannitol) and provisions for opportunities for hearings are discussed. The problem of choosing appropriate, legally acceptable names for declaring these sweeteners on food product labels is considered. VJG

92

**Canned pineapple juice standards of identity and quality.**

United States of America, Food & Drug Administration

*Federal Register* 41 (105, May 28) 21768-21770 (1976) [En] [Washington, DC, USA]

The standards for canned pineapple juice under the Federal Food, Drug and Cosmetic Act are revised to permit the use of conc. juice (final Brix 13.5° in finished product), liquid sweetener, and any dry nutritive sweetener rather than just sugar, and to require label declaration of all optional ingredients. CAS

93

**The structure-taste relationships of aspartyl dipeptide esters.**

Ariyoshi, Y.

*Agricultural and Biological Chemistry* 40 (5) 983-992 (1976) [28 ref. En] [Cent. Res. Lab., Ajinomoto Co. Inc., Suzuki-cho, Kawasaki-ku, Kawasaki 210, Japan]

94

**[Steric arrangement of sweet and bitter taste of amino acids and peptides.]** Zur

Konfigurationsabhängigkeit des süßen oder bitteren Geschmacks von Aminosäuren und Peptiden.

Belitz, H.-D.; Wieser, H.

*Zeitschrift für Lebensmittel-Untersuchung und -Forschung* 160 (3) 251-253 (1976) [10 ref. De, en] [Inst. für Lebensmittelchem., Tech. Univ., Lothstrasse 2, D-8000 Munich, Federal Republic of Germany]

The occurrence of a sweet or bitter taste in amino acids and peptides is related to the steric arrangement of polar and hydrophobic groups in the molecule. [See also FSTA (1976) 8 3A124.] AS

95

**[Swiss food handbook. Methods for examination and evaluation of foodstuffs and items of utility. Vol. II. Ed. 5. 6th Supplement (1971).]**

Schweizerisches Lebensmittelbuch. Methoden für die Untersuchung und Beurteilungen von Lebensmitteln und Gebrauchsgegenständen. Zweiter Band. Fünfte Auflage. 6. Lieferung (1971). [Book]

Switzerland, Schweizerische Lebensmittelbuchkommission; Switzerland, Eidgenössisches Gesundheitsamt 70pp. (1971) [De] Berne, Switzerland; Drucksachen- und Materialzentrale

This 6th supplement of the official handbook contains the following 3 sections (with indexes): Spirits (section 32, 24pp.); Artificial sweeteners (section 41, 13pp.); and Tea and herb tea (section 57, 33pp.). [See preceding abstr. for supplement 5.] JA

96

**[Sugars and sugar substitutes in preventive medicine and nutrition.]** Zucker und Zuckeraustauschstoffe in der Präventivmedizin und in der Ernährung. [Lecture]

Stare, F. J.

*Zucker* 29 (3) 103-107 (1976) [De, en, fr] [Dep. of Nutr., Harvard School of Public Health, Boston, Massachusetts 02115, USA]

97

**[Quantitative determination of  $\alpha$ -L-aspartyl-L-phenylalanine methyl ester in foods.]**

Ishiwata, A.; Suzuki, Y.

*Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi]* 16 (6) 420-421 (1975) [2 ref. Ja] [Cent. Res. Lab., Ajinomoto Co., Inc., Suzuki-cho, Kawasaki-shi, Japan]

The quantitative analysis of  $\alpha$ -L-aspartyl-L-phenylalanine methyl ester in beverage and foods was studied using an amino acid analyser. The samples were pretreated with a citrate buffer solution of pH 2.2 and analysed with an elution buffer solution of pH 4.2 plus added 1% benzyl alcohol. TM

98

**[Polarographic determination of saccharin in beverages and foods.]** Polarographische Bestimmung von Saccharin in Getränken und festen Lebensmitteln.

Dungen, P. W. C. M. van den

*Zeitschrift für Lebensmittel-Untersuchung und -Forschung* 161 (1) 61-63 (1976) [8 ref. De, en] [Keuringdienst van Waren, 'S-Hertogenbosch, Oude Dieze 12, Netherlands]

The method is based on the fact the saccharin in alkaline 0.1 M  $\text{CaCl}_2$  solution (pH, approx. 10.5) gives with an Ag/AgCl electrode a well-defined polarographic step with half-step potential of -1.8 V. As various components of beverages and solid





ods destroy the polarograms, they must be removed from a mixture of the sample with  $\text{N}_2\text{SO}_4$  and Celite 545 using light petroleum, saccharin being then extracted with a diethyl ether/light petroleum mixture (30/70). The procedure is described in detail. The sensitivity of the method is 5 ppm saccharin. SKK

9

**Determination of saccharin in soft drinks by molecular emission cavity analysis.**  
Belcher, R.; Bogdanski, S. L.; Sheikh, R. A.; Townshend, A.

*Analyst* 101 (1204) 562-565 (1976) [12 ref. En]  
Dep. of Chem., Univ. of Birmingham, PO Box 63, Birmingham B15 2TT, UK]

Saccharin (20-800 ppm) was assayed in various soft drinks and soft drink concentrates by extraction into ethyl acetate and detn. by molecular emission cavity analysis, based on the  $\text{S}_2$  emission generated by the saccharin, using a nitrogen-diluted hydrogen-air flame. The procedure is rapid, sensitive and very selective because only an S-containing emission is measured. If necessary the technique can be extended to detn. of cyclamate salts of N-cyclohexylsulphamic acids). AL

100

**Studies on cultivation of Stevia rebaudiana Bertoni. Determination of stevioside. I.]**

Mitsuhashi, H.; Ueno, J.; Sumita, T.

*Journal of the Pharmaceutical Society of Japan [Yakugaku Zasshi]* 95 (1) 127-130 (1975) [10 ref. Ja, en] [Fac. of Pharm. Sci., Hokkaido Univ., Kita 12 jo Nishi 6 chome, Kitaku Sapporo, Japan]

Experiments were carried out since 1971 to find the optimum cultivation conditions for Stevia rebaudiana Bertoni which contains a diterpene-type sweet substance stevioside, a possible sugar substitute. Seasonal and local variations in stevioside content were 5.13-7.27% stevioside at 5 locations in Japan, and 1.22-7.84% in 28 morphologically different strains. RM

101

**Studies on the cultivation of Stevia rebaudiana Bertoni. Determination of stevioside. II.]**

Mitsuhashi, H.; Ueno, J.; Sumita, T.

*Journal of the Pharmaceutical Society of Japan [Yakugaku Zasshi]* 95 (12) 1501-1503 (1975) [3 ref. Ja, en] [Fac. of Pharm. Sci., Hokkaido Univ., Kita 12 jo Nishi 6 chome, Kitaku Sapporo, Japan]

TLC analysis was established for simple quantitative analysis. Seasonal variation in the content of stevioside and its content in samples cultivated at 12 different places in Japan were examined by this method. In addition, 24 samples classified by their morphological characteristics, were examined for their stevioside productivity. AS

102

[Food-grade xylitol.]

Union of Soviet Socialist Republics,  
Gosudarstvennyi Komitet Standartov  
*Soviet Standard GOST 20710-75*, 11pp. (1975)  
[Ru]

The standard applies to crystalline, food-grade xylitol obtained from pentosan-containing vegetable raw material (cottonseed husks, corn cob stems) and intended as a sugar substitute for diabetics. 25 g xylitol must be fully soluble in 50 ml water at 20°C. 1st and 2nd grade xylitol shall contain  $\leq 1.5$  and  $\leq 2\%$  moisture, respectively; the reducing substances and ash contents shall be  $\leq 0.08\%$  (in terms of DM); the mp shall be 90-94°C, and the pH 4.5-7.5, and there is no tolerance for Ni or Pb. The standard also covers testing, packaging, transport and storage. After expiration of the guaranteed shelf life (1 yr), the xylitol shall be retested prior to use. KME

103

**Economic factors affecting future sweetener consumption.**

Kolodny, S.

*Sugar y Azucar* 71 (7) 20-21, 23-26, 28, 61-62, 65-67 (1976) [En, Es] [American Sugar Div., Amstar Corp., New York City, New York, USA]

Likely trends in sweetener consumption in the USA are discussed, with reference to tables and graphs of data for sweetener consumption during the period 1950-1975. Aspects considered include: the overall trend towards increased consumption; direct use vs. use in processed foods; social factors; political factors; economic factors; competition between sucrose and corn-based sweeteners (with special reference to high-fructose corn syrups); and the significance of synthetic sweeteners. AJDW

104

**Sweetened cereal.**

Baggerly, P. A. (General Foods Corp.)

*United States Patent* 3 955 000 (1976) [En]

The sweetened breakfast cereal has a coating of an L-aspartic acid sweetening derivative. IFT

105

**High fructose corn syrups for bakery applications.**

Sausele, H., Jr.; Ziegler, H. F.; Weideman, J. H.

*Bakers' Digest* 50 (1) 32-34 (1976) [En]  
[Anheuser-Busch Inc., St. Louis, Missouri, USA]

The properties of high-fructose corn syrups, produced by enzymic isomerization, are described, and bakery application test results are given. Pound for pound replacement of sucrose in bread did not appreciably affect production parameters such as proof time and loaf vol. Cakes were not texturally altered by 25% sucrose replacement by corn syrup, but crust and crumb colours were darkened due to increased browning reactions. Cookies and sweet doughs made with syrup also showed a functional equivalence of syrup and invert sugar or sucrose. JRR





## 106

[Stevioside, an interesting natural sweetener.]  
Steviosid, ein interessantes, natürliches  
Süßungsmittel. [Review]  
Seidemann, J.

*Nahrung* 20 (6) 675-679 (1976) [39 ref. De]  
[Schubertstrasse 1, 1505 Potsdam-Rehbrücke,  
German Democratic Republic]

The natural sweetener stevioside (isolated from  
leaves of the bush *Stevia rebaudiana*) is discussed  
on the basis of literature data. Aspects considered  
include physico-chemical characteristics, structure,  
relative sweeteners, toxicology, and potential for use  
as a sweetener in foods and drugs. IFT

## 107

[Cycloalkylsulphamic acids and their salts. V.]  
Cycloalkylsulfaminsäuren und ihre Salze. V.  
Unterhalt, B.; Böschmeyer, L.

*Zeitschrift für Lebensmittel-Untersuchung und -  
Forschung* 161 (3) 275-276 (1976) [5 ref. De,  
en] [Inst. für Pharmazeutische Chemie &  
Lebensmittelchemie, Univ., Marbacher Weg 6, D-  
3550 Marburg, Federal Republic of Germany]

3-Methyl-4-thia-cyclohexylsulphamic acid was  
synthesized, the degree of sweetness of its sodium  
salt was measured, and compared with that of the  
sodium salts of 3-methyl-cyclohexylsulphamic acid,  
4-thia-cyclohexylsulphamic acid, and  
cyclohexylsulphamic acid. [See FSTA (1975) 7  
10T508 for part IV.] AS

## 108

Sweeteners.

MacAndrews & Forbes

*British Patent* 1 432 452 (1976) [En]

Low calorie sweetener compositions are based  
on ammonium glycylrrhinate and a 5'-nucleotide  
to suppress the unpleasant taste. IFT

## 109

[Sweeteners.]

Hayashihara Co. Ltd.

*Japanese Patent* 5 112 707 (1976) [Ja]

Low calorie sweetening compositions are based  
on maltitol and maltotriitol. IFT

## 110

Sweetening composition.

Shoaf, M. D.; Pischke, L. D. (General Foods  
Corp.)

*United States Patent* 3 956 507 (1976) [En]

The methyl ester of L-aspartyl L-phenylalanine is  
stabilized into a flowable particulate form for use as  
a sweetener. IFT

## 111

Sweeteners.

Alberto Culver Co.

*British Patent* 1 431 822 (1976) [En]

Low calorie, pulverulent, dry sweetening  
compositions contain aspartylphenylalanine and  
starch hydrolysates. IFT

## 112

Sweetening compositions.

Rank Hovis McDougal Ltd.

*British Patent* 1 430 452 (1976) [En]

Low calorie sweeteners in the form of porous  
agglomerates of spray-dried particles are based  
upon dextrose and cyclohexylsulphamic acids or  
saccharin. IFT

## 113

Sweetening composition.

L. Givaudan & Cie SA

*British Patent* 1 428 945 (1976) [En]

Sweetener mixture containing dihydrochalcone  
and glucono- $\delta$ -lactone, gluconic acid or its salts to  
inhibit delays in sweetening activity. IFT

## 114

L-Aspartylaminomalonic acid diesters.

Takeda Chemical Industries Ltd.

*British Patent* 1 434 043 (1976) [En]

Sweetening agents contain L-aspartyl-  
aminomalonic acid derivatives of alkyl fenchyl  
diesters. IFT

## 115

Sweetening agent.

Pischke, L. D.; Shoaf, M. D. (General Foods  
Corp.)

*United States Patent* 3 962 468 (1976) [En]

Process for fixation of L-aspartic acid derivative  
sweetening compounds on dextrin is described.  
IFT

## 116

[Natural sweeteners and effects on taste.]

Natürliche Süßungsmittel und

Geschmacksbeeinflussung.

Pieniazek, S. A.

*Industrielle Obst- und Gemüseverwertung* 61 (9)

229-231 (1976) [De]

Of the common artificial sweeteners, saccharin is  
generally used in low-calorie diets but is sometimes  
disliked due to after-taste and its synthetic origin.  
Natural sweetener-flavours are known from various  
plants, mainly in tropical Africa; 4 of these are  
discussed in detail with illustrations. The best-  
known is 'wonder fruit' (*Synsepalum dulcificum*),  
widely used in native dishes and beverages in

Ghana; the fruit pulp is pleasantly sweet,  
neutralizes sour or bitter flavours, is active for 4 h  
on the palate and gives excellent flavour with citrus  
fruits. The active ingredient is a glycoprotein now  
known as Miraculin. Another climbing plant  
(*Gymnema sylvestre*) also yields a sweet product,  
with a different flavour due to an additional quinine  
fraction. Two further plant products could be  
equivalent to saccharin in low calorie diets:  
*Dioscoreophyllum cumminsii* (Serendipity berry)  
has a berry pulp with 90 000  $\times$  the sweetness of  
sucrose, due to the glycoprotein Monelin.  
*Thaumatococcus domiella* (no common name)  
produces a glycoprotein Thaumatin with a  
sweetness 30 000  $\times$  that of sugar. There are  
attractive possibilities of preparing tablets from  
wonder berry, Monelin, or (particularly) Miraculin,  
and of widespread use in the food industry for low





calorie products e.g. jams, confectionery, fruit  
products, general restaurant use, with the further  
advantage of absence of after taste. ELC





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